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THE

HYDRO-THERAPEUTIC TREATMENT

OF

TYPHOID FEVER,

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WM. B. BURFORD, PRINTER, INDIANAPOLIS.

[Reprint from Transactions of Indiana State Medical Society, 1889.]

The Hydro-Therapeutic Treatment of Typhoid Fever.

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In 1870 I began the treatment of typhoid fever by a systematic application of cold baths and the administratiou of antipyretic doses of quinine after the German method, keeping a careful record of my cases, and the result was communicated to the profession in a paper read in December, 1878, before the District Medical Society of Western Indiana, which paper was published in the American Practitioner, in January, 1879. This paper was the first one published in the United States giving a detailed account of this treatment in any considerable number of cases, and it met with a great deal of adverse criticism.

In 1883, before the Mississippi Valley Medical Society, at its session in this city, I read a supplemental paper upon the same subject, in which I gave my observations up to that time, and tabulated one hundred and fifty-seven cases treated upon this plan, by myself and two or three professional friends, with three deaths—a mortality of 1.9 per cent. This paper was published in the Cincinnati Lancet and Clinic.

This plan of treatment has never been popular with the profession in this country or England. It has not been regarded with that degree of favor or received the attention which its importance demands. The apparent neglect or indifference with which the brilliant results of this treatment have been received by the profession, together with the severe and unjust criticisms which it has received by those opposed to it, is my

apology—if any were needed—for bringing it before the society. I expect to be able in this discussion to convince the most skeptical, by an array of facts and figures from sources, the correctness and trustworthiness of which can not be questioned, that the hydro-therapeutic treatment of typhoid fever is the most rational, as well as the most successful, of any that has ever been proposed. All preconceived opinions and prejudices should be laid aside in scientific investigations. We should seek the truth and the truth only; and when we once strike its trail it should be scrupulously and honestly followed even if it plunges us over the Falls of Niagara.

Brand, although not the originator of this plan of treatment, is certainly entitled to the honor of its revival. After the publication of his marvelous successes, in 1861, he found many imitators; and several theories were advanced in explanation of its modus operandi. Brand never claimed for this treatment that it owed its beneficial results to the abstraction of heat exclusively, but that it derived its benefits from the powerful and healthy reaction which followed the cold bath; that the overburdened and stupefied nervous system was stimulated into action, and that by lowering the temperature and restoring the secretions, the broken-down products caused by the oxidation of the tissues were eliminated from the system, and parenchymatous and fatty degenerations—which are known to be so fatal in this disease—were prevented.

Liebermeister advanced the plausible theory, based upon the success of Brand in the treatment of typhoid fever by the abstraction of heat, that the secondary lesions of this fever, which consist of congestions, inflammations and degenerations of important organs, were caused by the persistent elevation of temperature, which is a characteristic of this fever. This view of the matter advocated by Liebermeister has resulted disastrously in the extreme, and has been the cause of many deaths from this disease. Nervous and timid doctors have abandoned the cold bath and resorted to antipyretic medicines, which, although they will lower the temperature, lack the essential element of exciting a booming reaction, and the patient is lost. Yet even this is better than the purely expectant plan. The statistics gathered from the health office of New York City by

Dr. Baruch show a mortality of 41.28 per cent. in 7,712 cases, while Delafield's reports, gathered from the New York City Hospitals, under a mixed expectant and antipyretic treatment by antipyretic medicines, show a reduction to 24.66 in the mortality—a gain of over 15 per cent.

Liebermeister's theory has excited considerable controversy amongst the experimental pathologists, which has added something to our knowledge of this subject, although their work has not been altogether free from partisanship. These experiments were performed upon rabbits, dogs and guinea-pigs, by subjecting them to artificial heat, applied externally, in hot boxes constructed for that purpose. In Dr. Welch's experiments, as detailed in his Cartwright lectures, he kept two black rabbits in a hot box for three weeks, with an average temperature in the rectum, in one case, of 106.6°, Fahrenheit, and in the other case, of 107.3°. At the end of the experiment, the rabbit whose temperature had reached 106.6° was killed, and a well-marked fatty degeneration of the heart, liver and kidneys was found. In other experiments he found fatty degeneration at the end of a week in rabbits whose temperature had been kept at 106°. Wickham, Legg and Litten found fatty and parenchymatous degeneration in all of their experiments in from thirty-six to forty-eight hours. The opponents of Liebermeister's theory that persistent elevation of temperature was the cause of death in typhoid fever took great comfort from the result of Dr. Welch's experiments, and claimed that they were unanswerable; but a careful examination and analysis of these experiments produces a confirmation as strong as Holy Writ that Liebermeister's explanation is the correct one, at least so far as any experiment upon the lower animals can be applied to explanations of physiological and pathological processes in man. The normal temperature of a rabbit is about 103°, Fahrenheit. The normal temperature of man is about 98.5°. An elevation to 106° in the rabbit is equal to 101.5° in man, while 107° in the rabbit would equal 102.5° in man. No advocate of antipyrexia claims any particular danger in a temperature of 102.5°. In fact the treatment is not recommended for a temperature of less than 103°. Dr. Welch did not fail to find degeneration in from five to ten days, with an

elevation of three or four degrees above the normal, by heat applied externally, while Litten found it by the second or third day, none of his animals living longer than five or six days. There is a vast difference between the effect of an elevation of temperature from external sources and the intense internal chemical fire kindled by infection when the blood and tissues are loaded with the debris of oxidized tissue and the poisonous ptomaines caused by the propagation and growth of millions of bacteria. However valuable experiments upon the lower animals may be in determining the problems of the nervous system, the circulation, digestion, secretion, and the pathology of inflammatory diseases, little or nothing can be learned by them in studying the pathology or therapeutics of fever. In man, the heat-eliminating apparatus is arranged upon an entirely different and much superior plan from what it is in the hairy animals. Seventy-seven and one-half per cent. of his heat is dissipated by the skin, and 22½ per cent. by the other organs. In the animals subjected to these experiments these proportions are reversed; and candor compels me to concede that the application of an external heat sufficient to cause degeneration of the organs and death in a rabbit would have little or no deleterious effect upon a healthy human being. Man is the only truly cosmopolitan animal which nature has ever produced. With his splendid heat-regulating machinery, he can accomodate himself to forty, fifty or sixty degrees below zero in the Arctic regions, and can exist with comparative comfort upon the sandy deserts of the Tropics, with a temperture of two hundred degrees in the sunshine and one hundred and twenty-five in the shade. More than a century ago, Doctors Fordyce and Blagden demonstrated their ability to withstand with impunity the heat in a furnace the temperature of which was two hundred and sixty degrees, Fahrenheit. It is perfectly plain to my mind that no valuable corollaries can be drawn from experiments with hirsute animals confined in hot boxes that will enlighten us upon the effects of long-continued elevation of temperature which is caused by fires kindled by infection in the human species. Neither can much information be gained by experimenting with drugs upon these animals. Less than one-twentieth of a grain of strychnine will kill a good-sized dog, while it requires six grains of morphine to kill a

rabbit which weighs less than two pounds. I have fed with my own hand to a goat 1.75 pounds of fine-cut tobacco, and his appetite for the pernicious weed was unsatisfied at the end of the seance, while a small pig, in one of my experiments, enjoyed excellent health for months after concealing somewhere about his anatomy a sufficient quantity of arsenic to kill twenty men.

Theories come and go, and I regret to say that our knowledge of the real pathology of fever is still unsatisfactory. The ancients believed that fever was a conservative process, and ought to be encouraged, and hence their treatment consisted of a process called coction, which was supposed to favor a crisis by which the morbid material was to be eliminated. The pendulum is again swinging in that direction, and Dr. Welch suggests, in his Cartwright lectures, that fever may be an effort of the system to destroy the bacteria with which the body is infected. Nature will remove a splinter from the cornea, but the process of suppuration by which it is accomplished destroys vision. So will a sufficient elevation of temperature kill bacteria, but it is certain death to the individual whose body is used for the bake-oven in which it is done. One well established fact is worth a thousand theories, however plausible they may appear. The normal temperature of man under varying circumstances is about 98.5, while the temperature of birds in their normal condition, in some species, is as high as 112 degrees. So it will be seen that a temperature which is normal for some forms of life would be certainly and quickly fatal to others. Any considerable elevation of temperature which is more than transient demands the attention of the physician. The condition known as fever may be present and caused by an excess of heat production with an increased heat elimination, or an excess of heat production with a diminished elimination, or a diminished heat elimination without any increase in heat production. Practically, it matters not how this disturbance is brought about. We have to deal with a condition, and not a theory. It may be caused by the disturbance of a heat center in the brain, by which the correlation existing between heat production and heat elimination is disturbed, or it may be caused by the oxidation of the tissues, arising from

the propagation and growth of the infecting bacteria, with the poisonous ptomaines thereby engendered; and the disturbance in the nervous system may be of secondary importance.

Time forbids the discussion of the pathology and symptomology of typhoid fever in this paper any further than is absolutely necessary to explain the rationale of the treatment. The specific, or primary, lesions of typhoid fever consist of the hyperemia of the mucous membrane of the small intestine, together with the infiltration, and sloughing of the solitary and agminated glands, with their subsequent ulceration. These and some changes of minor importance which take place in the mesenteric glands, spleen, etc., are as characteristic of typhoid fever and are as necessary to the existence of a typical case as are the eruptions in the exanthematic or specific lesions which take place in any of the acute infectious diseases. Death may take place from these lesions. The necrobiotic process in Peyer's patches may open blood vessels sufficiently large to cause death from hemorrhage, or perforation may result, followed by a fatal peritonitis. Only a small percentage of the mortality in this disease, however, is caused by the specific lesions. I find in examining a large number of statistics that less than six per cent. have hemorrhage, and about thirty-eight per cent. of these die, and about one per cent. of the totality of cases have perforation of the bowel, and a small portion of these recover, so that the entire mortality of this disease arising from the specific lesions is not over three per cent. It is plain, then, that we must look to the group of secondary lesions, or those caused by the general disease, for the cause of the heavy mortality in typhoid fever. These structural changes consist of congestions, inflammations, and fatty and parenchymatous degenerations of important organs, and may affect any organ or tissue in the body. They are found present in post mortems where death occurred from any of the acute infectious diseases which are caused by persistent hyperpyrexia. These changes depend either upon the long continued elevation of temperature which is present in this fever, or are due to the infection, or, what is more probable, to both. The argument that these secondary lesions are the result of persistent elevation of temperature is a strong one. Statistics show that with a

purely expectant plan of treatment, where the temperature did not reach 104° Fahr., the mortality was about 9 per cent.; where it passed 104° but did not reach 105°, the mortality was 29 per cent.; where it passed 105° but did not reach 106°, the mortality exceeded 50 per cent., and when it passed 107°, recovery was rare. The brain is one of the first organs to suffer from this fever. In cases running a mild course where the elevation of temperature is not sufficiently high to cause delirium, the mortality is about three or four per cent. Slight delirium with excitement of a low grade lasting but a short time or appearing only at night results in a death rate of 20 per cent. Well marked delirium gives a mortality of about 50 per cent. Where profound stupor or coma is present, over 70 per cent. die.

The mortality in typhoid fever varies greatly in different epidemics and in different countries. It is a difficult matter to arrive at a satisfactory conclusion in regard to the exact death rate. In the French Army from 1875 to 1880 inclusive, in 26,000 cases, the death rate was over 36 per cent. German statistics, under the expectant plan of treatment which was used prior to 1861, gave a mortality of about 28 per cent. In the Italian Army the mortality was 28.6 per cent., in the Austrian Army, 27.4 per cent., and in the English Army, about 24 per cent. The death rate taken from reports of our health boards in this country is still more alarming, New York City alone showing from 1876 to 1885, in 7,712 cases, a mortality of over 41.28 per cent., while in the New York City hospitals, in 1,305 cases, under a mixed treatment, 24.66 per cent. was the death rate. In comparison with this heavy mortality, I wish to quote some statistics, the authenticity and correctness of which can not be questioned or doubted, coming as they do from official sources, hospital records, army surgeons and university clinics, and being the result of the observations of men whose skill and ability will permit no doubt of the correctness of the diagnoses. The analysis of the statistics of the German Army are valuable and convincing. From 1820 to 1844 the death rate exceeded 25 per cent. From 1868 to 1874, under a partial and imperfect antipyretic treatment, the mortality was reduced to 15 per cent. From 1874 to 1880 this

treatment was more general, and the death rate was further reduced to 8 per cent. In the second army corps, where the plan was more vigorously pushed, the mortality fell to 5 per cent. Still more striking is the confirmation afforded by the five general hospitals of this corps, which were under the immediate and personal supervision of Dr. Abel, who is a strenuous upholder of this plan of treatment. In 1860 the mortality was 25 per cent. By 1877 it was lowered to 7 per cent., and during the five years immediately following the coming of Dr. Abel it fell to 14 deaths in 764 cases, or 1.8 per cent. In the Red Cross Hospital at Lyons, France, under a purely expectant treatment, the death rate was 26.2 per cent. Intermediate treatment gave a death rate of 16.5 per cent. Strictly cold baths reduced this mortality to 5 per cent. Ziemssen's statistics at Tubingen University Clinic, treated with the graduated cold bath, with antipyretic medicines, in 2,000 cases, gives a mortality of 9.6 per cent. The Konigsberg Clinic, under strictly cold baths, gives a mortality of 6.9 per cent. Brand has recently published statistics which are more convincing still. He tabulates 19,017 cases which have been treated, many of them in a very imperfect manner, in which he shows that by this treatment, even thus imperfectly enforced, the mortality has been reduced from 22 per cent. to 7.8 per cent. He goes still further, and publishes a series of cases obtained from French and German sources, which have not been questioned, of 5,573 cases, in which the treatment was more rigidly enforced, with a further reduction in the death rate to 3.9 per cent. Still, many of the cases were treated imperfectly. Eliminating these, and taking 1,223 cases treated by himself partly in private practice, and partly by Juergeson, at Tubingen and Vogel, at Munich and the military hospitals at Stralsend and Stettin, the number of deaths was 12, less than 1 per cent. But still further, taking 2,150 cases where the treatment was strictly enforced and where it was begun before the fifth day, not a single death occurred.

These statistics, coming from the sources which they do, claim our serious and careful consideration. No one has any right to oppose this treatment upon purely theoretical grounds. He who does so, and refuses to adopt it, signs the death war-

rant of twenty individuals out of every hundred with this disease which he treats, and a discriminating public will hold him responsible. This plan of treatment is not an idle tale, to be whistled down by a breath of wind. It is a genuine Banquo's ghost, which will not down at anybody's bidding. The "antipyretic craze," as it is called, has come to stay. This treatment prevents death from hyperpyrexia by a sudden failure of the heart's action or paralysis of the brain, including the respiratory centers. It prevents death from the secondary lesions, from whatever cause they may arise—thus reducing and confining the fatal cases to those caused by the specific lesions, which statistics show to be less than three per cent. But even this small per cent. may be further reduced, for Brand has shown conclusively that the lesion in the bowel does not proceed farther than the infiltration, when this treatment is begun early. All observers are agreed that to get the best results from this treatment it must be begun early, before the secondary lesions have been developed or the primary lesions have progressed farther than that of infiltration. After the group of symptoms known as the typhoid condition has appeared—which is contemporaneous with the secondary lesions—it is too late for the treatment to achieve the brilliant results which follow its early administration. It matters not how the modus operandi of this treatment is explained, whether its benefits are derived from the abstraction of heat or from the reaction which follows the shock of the bath, the fact remains the same, that it is the most successful treatment which has ever been proposed for typhoid fever and is equally successful in all forms of fever. Dr. Currie demonstrated clearly, over one hundred years ago, that typhus fever could be aborted by it, that smallpox and scarlet fever were rendered mild and tractable diseases by its early adoption. His method of using cold water was by affusion. Five or six gallons of cold water (44°) were dashed upon the body of the patient, while seated in a bath tub. Brand, Liebermeister, and others immerse the patient in cold water the temperature of which is not less than 65° Fahr., repeating it as often as the temperature reaches 103°. Ziemssen uses water the temperature of which is at first about ten degrees lower than the temperature of the patient's body, cold water

added until it is gradually cooled to the required degree. This does not shock the patient, as does the strictly cold bath. But Ziemssen's statistics are not so favorable as Brand's, he having lost 9.6 per cent. in 2,000 cases.

It has been customary to supplement the cold bath treatment, in recent years, with antipyretic medicines, consisting of quinine, antipyrine, etc., under the supposition that the benefits derived from the treatment are due to abstraction of heat, and gradually the attempt has been made to substitute the antipyretic medicines for the baths. Brand opposes the use of this class of medicines, and claims that they reduce the mortality but little from the expectant plan. Quinine stands at the head of the list of antipyretic medicines, but neither quinine, antipyrine, antifebrin, nor any other medicine should be used to the exclusion of the bath. For, while they can be used as supplemental to bathing, having the effect of prolonging the intermission produced thereby, they can not be used successfully alone. All cases coming under treatment early—say before the close of the first week—should have two or three cathartic doses of calomel administered, consisting of eight or ten grains each, and if perfect results are to be expected from cold baths, they must be begun at once. As soon as the temperature reaches 103°, water should be applied, either by immersion in the cold bath of 65° or 70°, or the graduated bath of Ziemssen, or by Currie's method of affusion. I have used Kibbie's cot with good results. The application must be repeated as often as the temperature rises to 103°, until all danger is passed. Quinine administered in doses of from 25 to 45 grains, in the evening, will prolong the remission so that few baths will be required on the succeeding day. Antipyrine and antifebrin lower the temperature more rapidly than quinine, but the remission is much shorter, and they certainly have no influence in shortening the disease. Besides, they are not free from danger, for by their long-continued use they are said to destroy the red corpuscles of the blood. No deleterious effect, however, can be charged to the use of the quinine. Unpleasant cinchonism is not produced as often by large doses as is common in smaller doses, where it is continued from day to

day. It should not be administered in antipyretic doses oftener than each alternate day.

This plan of treatment has been so successful in my hands that I shall continue its use at least until something better is offered. Let us hope that some specific germicide may be discovered soon. Since publishing my last report I have treated 51 additional cases, with two deaths, which, added to the 157 already reported, with three deaths, give a total of 208 cases, with five deaths. Of the two deaths reported in this series, both were treated by antipyretic medicines and no baths. In every case where the bathing was energetically used, the patient recovered.

(The discussions of Dr. Smythe's paper follows Dr. McCullough's paper on Atypical Typhoid Fever.)